We claim:

1. A method of extracting a tomographic image of a target layer within a body by optical coherence tomography, comprising:

a) capturing a non-interference background image $I_d(x,y)$ of the body;

b) capturing a first interference-fringe image of said target layer $I_0(x,y)$;

c) capturing a second interference-fringe image $I_\varphi (x,y)$ of said target layer phase-shifted by an amount φ relative to said first interference-fringe image; and

d) computing said tomographic image $A(x,y)$ by mathematical manipulation of said non-interference image and said first and second interference-fringe images.

2. The method of claim 1, wherein multiple first and second interference-fringe images are obtained of said target layer at different times, and said multiple first and second interference-fringe images are processed to remove random noise.

3. The method of claim 1, wherein said tomographic image is obtained by solving the equation:

$$A = \{D_1^2 + [(D_2 - D_1 \cos \varphi) / \sin \varphi]^2\}^{1/2}$$

where $D_1 = I_0(x,y) - I_d(x,y)$, and $D_2 = I_\varphi (x,y) - I_d(x,y)$.

4. The method of claim 1, wherein said amount φ is $\pi/2$, and said tomographic image is obtained by solving the equation:

$$A(x,y) = \{ [(I_0(x,y) - I_d(x,y)]^2 + [(I_{\pi/2} (x,y) - I_d(x,y)]^2 \}^{½} .$$

5. The method of claim 1, wherein each computed tomographic image is compensated by applying a compensation function:

$$F(x,y) = [A(x,y) + k \bullet I_d(x,y)]^m \quad , \qquad (11)$$

where k is a weighting factor in the range of about 0~1, m is an index in the range of about 1~3, and $F(x,y)$ is the compensated tomography image.

6. The method of claim 1, wherein said first and second interference-fringe images are obtained with an interferometer having a sample arm and a reference arm, and the optical path length of one of said arms is varied to obtain said first and second interference-fringe images at said target layer.

7. The method of claim 6, wherein said interferometer includes a tilted beam splitter and a spatial filter mask to reduce DC noise.

8. The method of claim 7 wherein said beam splitter is tilted at an angle below about 5°.

9. An apparatus for extracting a tomographic image of a target layer within a body by optical coherence tomography, comprising:

a) an interferometer for creating interference-fringe images of layers within said body;

b) a camera for capturing images of said body including a non-interference background image;

c) a computer for controlling said interferometer to enable said camera to capture a first interference-fringe image of said target layer $I_0(x,y)$ and a second interference-fringe image $I_\varphi(x,y)$ of said target layer phase-shifted by an amount φ relative to said first interference-fringe image; and

d) said computer being programmed to compute said tomographic image $A(x,y)$ by mathematical manipulation of said non-interference background image and said first and second interference-fringe images.

10. The apparatus of claim 9, wherein said computer is programmed to obtain multiple first and second interference-fringe images of said target layer at different times, and process said multiple images to remove random noise.

11. The apparatus of claim 9, wherein said computer is programmed to compute said tomographic image by solving the equation:

$$A = \{D_1^2 + [(D_2 - D_1 \cos \varphi) / \sin \varphi]^2\}^{1/2}$$

where $D_1 = I_0(x,y) - I_d(x,y)$, and $D_2 = I_\varphi(x,y) - I_d(x,y)$.

12. The apparatus of claim 9, wherein said amount φ is $\pi/2$, and said computer is programmed to compute said tomographic image by solving the equation:

$$A(x,y) = \{ [(I_0(x,y) - I_d(x,y)]^2 + [(I_{\pi/2}(x,y) - I_d(x,y)]^2 \}^{1/2} .$$

13. The apparatus of claim 9, wherein said computer is programmed to compensate each tomographic image by applying a compensation operation:

$$F(x,y) = [A(x,y) + k \bullet I_d(x,y)]^m ,$$

where k is a weighting factor in the range of about 0~1 and m is an index in the range of about 1~3.

14. The apparatus of claim 9, wherein said interferometer has a sample arm and a reference arm and said computer is programmed to vary the optical path length of one said arms to obtain said first and second interference-fringe images at said target layer.

15. The apparatus of claim 14, wherein computer is programmed to vary the length of said reference arm.

16. The apparatus of claim 15, wherein said reference arm includes a reference mirror mounted on a translation stage controlled by said computer.

17. The apparatus of claim 9, wherein said interferometer includes a tilted beam splitter and a spatial filter mask in an image plane to reduce DC noise.

18. The apparatus of claim 17, wherein said spatial filter mask is a two-dimensional block function.

19. A method of decoding information from an information carrier containing information stored on multiple layers within the carrier, comprising:

a) capturing a non-interference background image $I_d(x,y)$ of the carrier;

b) capturing a first interference-fringe image of a selected layer $I_0(x,y)$ within said carrier; and

c) capturing a second interference-fringe image $I_\varphi(x,y)$ of said layer phase-shifted by an amount φ relative to said first interference-fringe image; and

d) computing a tomographic image $A(x,y)$ of said layer by mathematical manipulation of said non-interference image and said first and second captured images to obtain information stored on said selected layer.

20. The method of claim 19, wherein multiple first and second interference-fringe images are obtained of said selected layer at different times, and said multiple images are processed to remove random noise.

21. The method of claim 19, wherein said tomographic image is obtained by solving the equation:

$$A = \{D_1^2 + [(D_2 - D_1 \cos\varphi)/\sin\varphi]^2\}^{1/2}$$

where $D_1 = I_0(x,y) - I_d(x,y)$, and $D_2 = I_\varphi(x,y) - I_d(x,y)$.

22. The method of claim 19, wherein each computed tomographic image is compensated by applying a compensation operation:

$$F(x,y) = [A(x,y) + k \bullet I_d(x,y)]^m$$

23. A method of encoding information on a carrier, comprising:

a) providing a substrate having a solid background color; and

b) providing a stack of multiple layers on said substrate, each having information printed thereon with a transparent ink.

24. The method of claim 23, wherein said solid background color is black.

25. The method of claim 23, wherein said multiple layers are protected by a hard film with a near infra-red light window.

26. The method of claim 23, wherein an anti-reflective coating is provided on marginal portions of said carrier not containing information.

27. A method of encoding and retrieving information on a carrier by optical coherent tomography, comprising:

a) providing a substrate having a solid background color;

b) providing a stack of multiple layers on said substrate, each having information printed thereon with a transparent ink;

c) capturing a non-interference background image $I_d(x,y)$ of a target layer within the carrier;

d) capturing a first interference-fringe image of said target layer $I_0(x,y)$;

e) capturing a second interference-fringe image $I_\varphi(x,y)$ of said target layer phase-

shifted by an amount φ relative to said first interference-fringe image; and

f) computing said tomographic image $A(x,y)$ by mathematical manipulation of said non-interference image and said first and second interference-fringe images.